Cost-benefit examples of Rainwater Harvesting in steps of the Water Ladder

Eastern Cape (remote rural) and KwaZulu-Natal (metropolitan)

South Africa

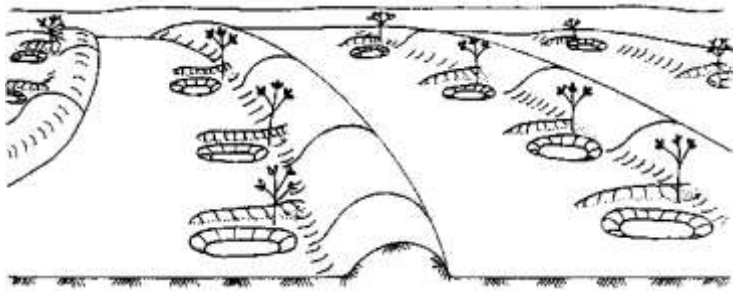
Multiple water Use Services (MUS)

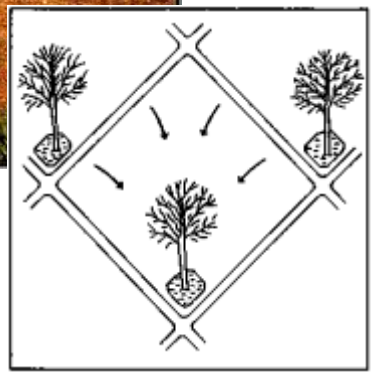
- MUS is about providing **water services** in support of **people's livelihoods**
  →i.e. ALL **water services planning** needs to be based on **livelihoods analysis**

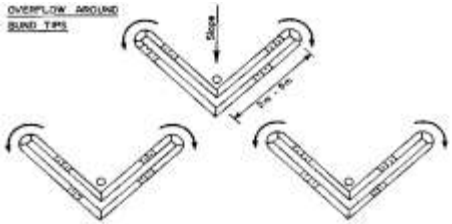
- **Philosophy**: regardless of starting point, in all water services planning, to ask:
  "Can we go further?"

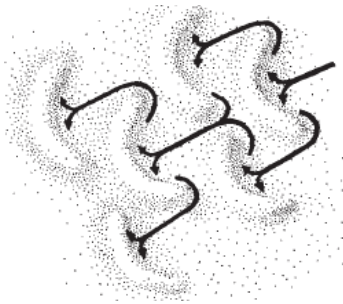
- **Operationalising 'Water ladder' implem:**
  - **Community vision (=water required for livelihoods)**
  - **Content and sequence of steps (=technical)**
  - **Optimal route to #4 (=econ & fin analysis)**

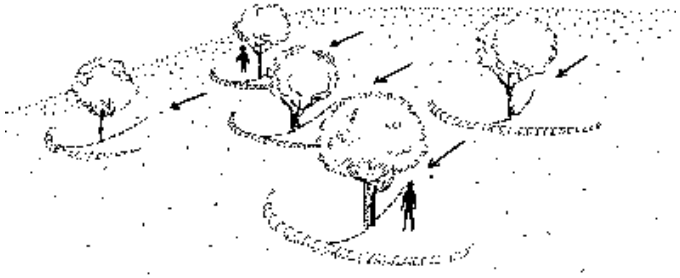
Rainwater techniques for Mzimvubu …for trees



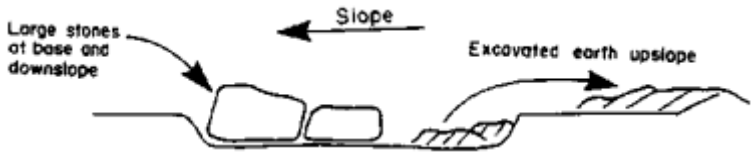








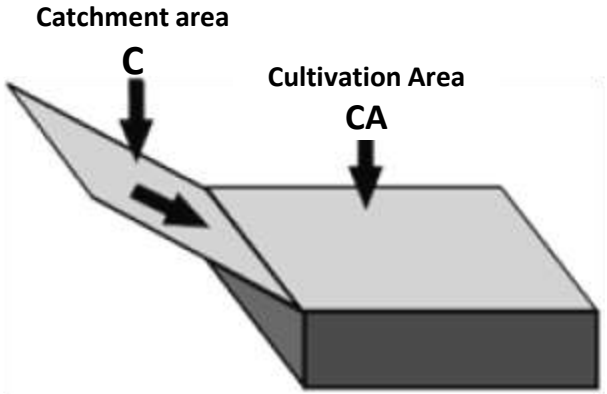
…for grazing and environmental restoration

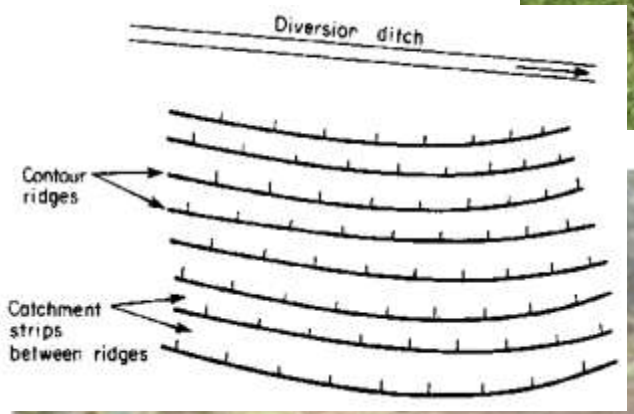


… in cropping fields

(<u>dryland</u>: less risk & larger areas

<u>irrigation</u>: less needed)





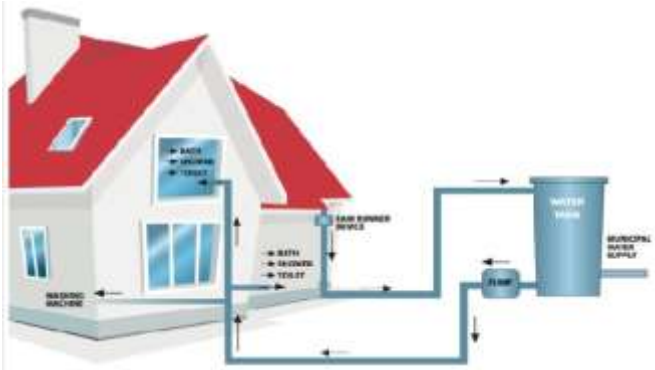
… to reduce malnutrition & stunting

Runoff storage in

←**soil profile ('green water')**

and in **tank ('blue water')** ↓

…for domestic water




…for domestic water
RWH as ‘Sole Supply’
–‘Free Basic Water’
(25-40 lpcd)

Do we have the numbers?

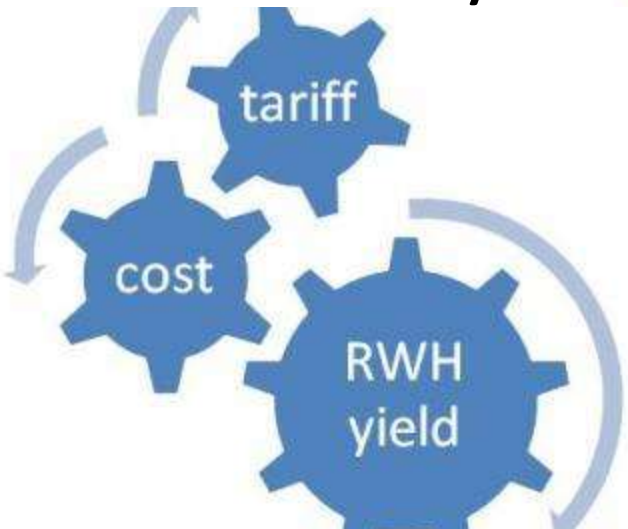
New tools (rough & ready, but giving valid insights)

RWH yield

- for any quaternary catchment in SA
- based on daily water balances for 50 years

Economics

- At household level
- At municipality level

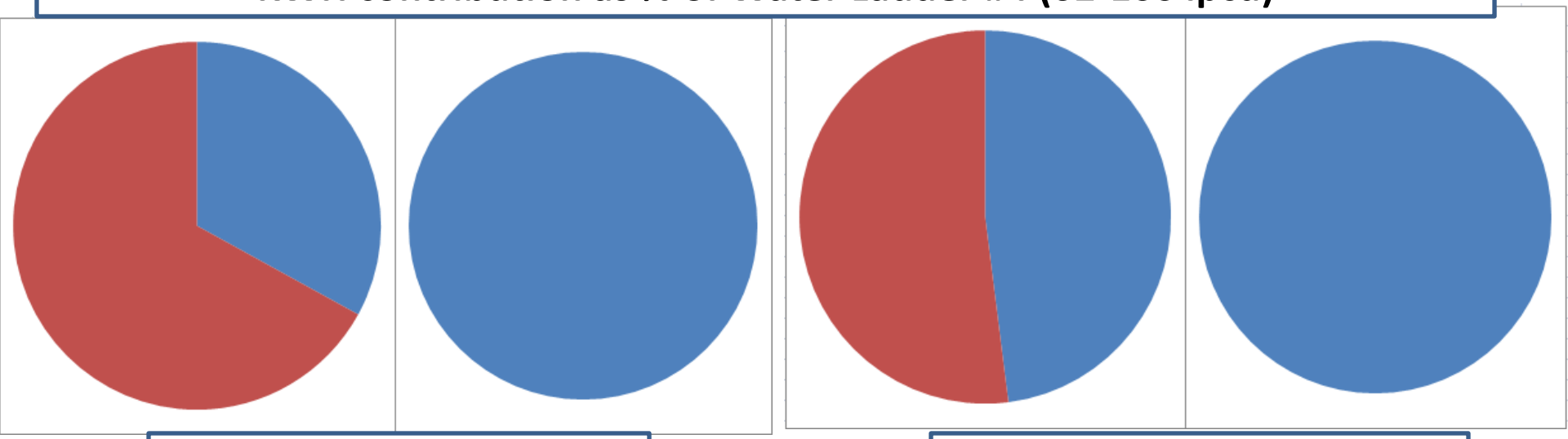


‘Sole supply’ situation

RWH contribution as % of Free Basic Water (25-40 lpcd)

‘Conjunctive use’ situation

RWH contribution as % of Water Ladder #4 (62-100 lpcd)



Matatiele area

Lusikisiki area

Household RWH yield

	Drawdown target Summer kl/m	Drawdown target Winter kl/m	Rainwater yield kl/a	Dry tank days days/a	% of FBW %	40m² roof with 5kl tank
R1	6	6	30.6	not applicable	43%	Full conjunctive use
R2	6	0	25.7	61	36%	
R3	5	0	24.6	39	34%	Zero winter use
R4	3	0	17.8	3	25%	
R5	3	0.5	20.6	9	29%	
R6	3	1	23.2	16	32%	Half FBW drawdown in summer;
R7	3	1.5	25	35	35%	some winter use
R8	3	2	25.8	63	36%	
R9	6	0	23.5	1	33%	
R10	6	1	27.5	2	38%	Full FBW drawdown in summer;
R11	6	1.5	28.3	4	39%	varying winter use
R12	6	2	28.7	6	40%	
R13	1	0	6.1	0	8%	Historic Firm Yield (i.e. tank never empty, even in worst year)

Rooftop RWH potential in eThekwini

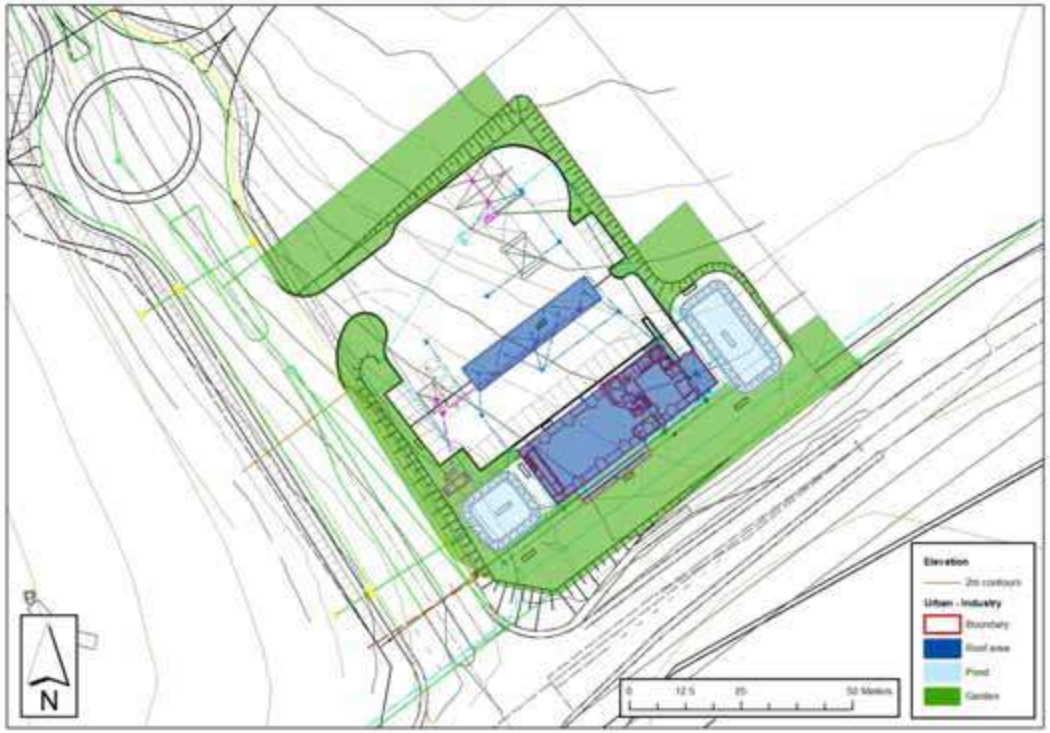
Results: Economy-wide impact of rooftop RWH

- Total volume of water harvested annually: **42 242 004 m^3/a**
- Total cost of scheme: **R3.4bn**

	URV	*Payback: (years)*	*B/C ratio*
Full subsidy & full O&M	**6.49**	**3.07**	**2.78**
Proportionate subsidy, no O&M	2.52	2.07	7.16
Proportionate subsidy, no O&M, + carbon	2.51	2.07	7.19

HH savings on municipal water bill

Tariff block	Roof area (m2)	Household usage (lpcd)	Current monthly water bill	RWH per household (lpcd)	RWH as % of household use	Billable usage after RWH	New total monthly bill for HH	HH's annual savings on water bill
1	40	49	R -	14.5	29%	0	R -	R -
1	60	49	R -	20.3	41%	0	R -	R -
2	100	121	R 77.87	35.2	29%	7	R 39.93	R 455.24
2	150	137	R 95.84	49.0	35%	7	R 42.98	R 634.34
3	200	164	R 136.79	66.8	40%	9	R 53.76	R 996.36
4	350	192	R 227.09	106.0	55%	7	R 41.43	R 2 227.91



Urban industrial example

capture area = 850m^2

property = 1 000m^2

- Planned new service station
- Stormwater attenuation (required temporary storage of 165 kl & off-peak release)
- Instead of full release: using stored water to augment municipal supplies (potential RWH 475 kl/a)
- Water requirement (cleaning offices + convenience store + carwash + gardens < 1 000 kl/a)

The Mzimvubu case - value of one hectare (profits)

- current land use is R83/ha pa and not sustainable
- potential multiple-use is worth R262/ha pa and sustainable